

**Honey Creek Bridge**  
Spanning Honey Creek at 105th Street  
Bangor vicinity  
Marshall County  
Iowa

HAER No. IA-39

HAER  
IOWA,  
64-BANG.V,  
1--

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**PHOTOGRAPHS**

**WRITTEN HISTORICAL AND DESCRIPTIVE DATA**

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Historic American Engineering Record  
Rocky Mountain Regional Office  
National Park Service  
U.S. Department of the Interior  
P.O. Box 25287  
Denver, Colorado 80225

HISTORIC AMERICAN ENGINEERING RECORD

Honey Creek Bridge

HAER No. IA-39

HAER  
IOWA,  
64-BANG.V,  
1-

Location: Spanning Honey Creek on 105th Street, Section 6, Township 85 North, Range 19 West, 2.0 miles north of Bangor, Marshall County, Iowa

UTM: 15.491840.4671930

Quad: Union, Iowa (7.5 Minute Series, 1975)

Date of Construction: 1910

Designer: Marshall County Engineer

Builder: N. M. Stark and Company, Des Moines, Iowa

Present Owner: Marshall County, Iowa

Present Use: Roadway bridge (scheduled for replacement in 1992)

Significance: Built by one of Iowa's most prominent and controversial bridge contractors during the heyday of his career, the Honey Creek Bridge is one of the earliest concrete girders built in Iowa and is among the last of the structures built before the statewide adoption of standardized designs. It thus represents the transition between the formative years in Iowa bridge construction, in which the counties were left to their own devices for roadway bridge construction, and the later years, in which bridge design on all levels were standardized and directed by the state highway commission. Concrete bridges -- and particularly concrete girder spans--were just beginning to find favor among Iowa engineers in the early 1910s when the Iowa General Assembly mandated the standardization of bridge design throughout the state. As a result, few such locally designed girders were built in Iowa. The Honey Creek Bridge is thus distinguished as one of the oldest concrete deck girders in the state.

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May 1992

*The Historic American Engineering Record (HAER) documentation for the Honey Creek Bridge was conducted by Fraserdesign of Loveland, Colorado, under contract with Marshall County, Iowa. The county has proposed the replacement of the structure, and this recordation is intended to mitigate in part the impact on the bridge by this action. Field recording of the Honey Creek Bridge was undertaken in February 1992. The research for this project has involved five primary archival sources: the Marshall County Auditor's Office, County Engineer's Office and the Marshalltown Public Library in Marshalltown, Iowa; the Des Moines Public Library and the Iowa State Historical Society Archives in Des Moines; and the Iowa Department of Transportation, in Ames, Iowa.*

Road and bridge conditions throughout Iowa were dismal around the turn of the century. Individually responsible for road construction, the counties rarely followed any systematic planning, and maintenance was largely sporadic and inept, despite statewide annual expenditures of more than four million dollars.<sup>1</sup> In response, the legislature formed the state highway commission in 1904 to help the counties manage their road and bridge work. At that time less than two percent of the state's roads were surfaced with gravel, and the "mud roaders" - a politically potent group opposed to government spending on road improvement - held sway with the county governments. "It seems absurd," noted one contemporary source, "that in a state so wealthy and prosperous, so advanced in education and intelligence, the entire agricultural economy and the basis for practically all business activity should be left to the mercy of bad weather on account of roads which would be a disgrace even to a barbarian."<sup>2</sup> The roads were poor, but the bridges were even worse. As reported by the state highway commission in 1907:

The forms of [bridge] construction may be classed as wooden, steel or masonry, or a combination of two or more of these materials. The various forms of construction that are made possible by their use have caused each county and township throughout the State to have a heterogeneous combination of structures designed and constructed without system and in many cases without the thought of the traffic that they are compelled to carry.<sup>3</sup>

As an alternative to these materials, the highway commission advocated using reinforced concrete for bridge construction. It built concrete demonstration culverts to illustrate their utility, durability and ease of construction. The commission also prepared standard designs for small-scale concrete bridges and special designs for larger structures in many counties. These initial efforts had minimal impact on bridge building, however, as the counties relied either on their own engineers or on commercial contractors for bridge design, and they invariably placed economy before safety in bridge construction.

**M**arshall County typified Iowa transportation trends at the turn of the century. When the first car was introduced into the county in 1903,<sup>4</sup> the highway system consisted of a patchwork of unsurfaced section-line roads that degenerated into impassable quagmires after every major storm. The bridges serving these roads were an unlikely collection of timber pile structures, steel beams and pin-connected trusses, all designed to carry wagon and pedestrian traffic. Conditions soon began to improve, however, as the proliferation of the motorcar forced sweeping changes in road and bridge construction throughout Iowa. The weakest link in the system, bridges were the first thing to change. The county's numerous small crossings over creeks and ditches made erection of hundreds of steel spans impractical. Timber structures were predictably short-lived. Small concrete culverts and bridges, on the other hand, could be built economically using standardized designs, were stronger under load and more resistant to washouts than other bridge types, and generally required only minimal maintenance.

The county participated in the state highway commission's concrete culvert demonstration program in 1907.<sup>5</sup> A year later the supervisors undertook the county's first concrete bridges, when they contracted for three small-scale structures with Des Moines bridge builder N.M. Stark.<sup>6</sup> In 1909, and again in 1910 and 1911, Marshall County hired Stark to build several more concrete structures of varying lengths.<sup>7</sup>

**T**he county was following another statewide trend in its exclusive dealings with Stark. By 1910 N.M. Stark and Company had become one of the most prolific bridge contractors in the state. Nathaniel M. Stark was an Iowa success story. Born in Indianola, Iowa, on May 18, 1863, he soon moved to Des Moines with his parents. Stark later received a degree in engineering from the State Agricultural College (now Iowa State University) and then worked for six months with the Elkhorn Railroad in Nebraska. In 1888 Stark became a field agent for the King Iron Bridge and Manufacturing Company of Cleveland. He worked for another Des Moines engineer, James Marsh, representing the immense bridge fabricator in projects throughout Nebraska, Wyoming and Idaho.<sup>8</sup> Stark joined with another former King representative, Lynn J. Tuttle, in forming N.M. Stark and Company in 1894. Among the firm's most notable early commissions were the Fort Dodge Viaduct (since replaced), for which Stark served as consulting engineer, and the Southwest Fifth Street Bridge over the Raccoon River in Des Moines. According to one biographer, Stark was especially proud of the Squaw Creek Bridge (1908), a three-span concrete arch bridge that he built in Ames - "one of the most beautiful and substantial of the kind in the state and will long stand as a monument to his ability."<sup>9</sup>

By 1910 Stark had built hundreds of highway bridges throughout the Midwest. He erected all types of timber, steel and concrete structures, but his forte was clearly the concrete arch.



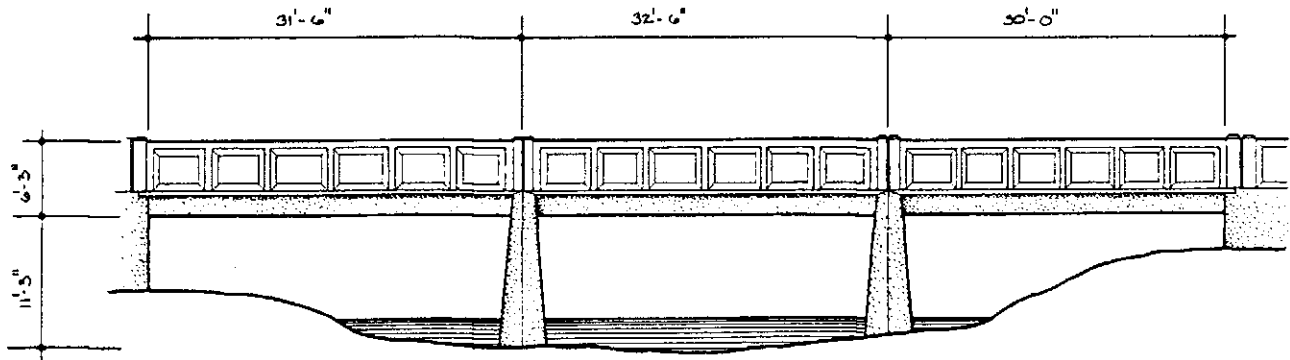
Figure 1. Advertisement in *Marshalltown Times-Republican*, 6 April 1910.

Stark functioned as a licensee for Indianapolis engineer Daniel Luten, designing and building Luten's patented filled spandrel concrete arches under a royalty payment agreement. By far the most prominent licensee in the state, Stark extensively promoted Luten's trademark elliptical arch, advertising in local newspapers (see Figure 1) and bidding frequently for county bridge contracts. His marketing was so skillful, in fact, that he served as the exclusive bridge contractor for several Iowa counties - including Marshall - in the early 1900s. And Stark's promotion of the Luten arch was so extensive that he was exceeded by only the state highway commission itself in the advancement of concrete for highway bridge use in Iowa.

When the Marshall County Board of Supervisors began planning the year's new bridges early in 1910, it selected concrete for their construction. "It has not yet been definitely decided where all of these bridges are to be built," stated the *Marshalltown Times-Republican*, but the supervisors were at the time considering building eight concrete structures with an aggregate cost of between \$20,000 and \$25,000.<sup>10</sup> The list had been pared down to seven structures by the time the county solicited competitive bids from bridge contractors, and eventually down to six after the proposals were received.<sup>11</sup>

The largest of these structures spanned Honey Creek about two miles north of the small town of Bangor, near the northern county line in Bangor Township. The Honey Creek Bridge carried Marshall County Road 59 (now 105th Street) over the creek at the intersection of County Road 22 (now Hart Avenue).<sup>12</sup> As delineated by the county engineer - perhaps from a Stark design - the bridge consists of three simply supported, concrete

deck girder spans with an overall length of 94 feet and an overall width of almost 22 feet (see Figure 2).<sup>13</sup> All of the bridge's components are reinforced concrete. The superstructure consists of four tapered girder ribs with a 1'2" width and a depth ranging from 2'1" to 2'5", poured integrally with a slightly crowned, 10-inch-thick concrete deck. These are supported by solid concrete abutments and piers with tapered cutwaters on both upstream and downstream sides. Four-foot-high concrete parapets form the guardrails, which join with 8-inch-high concrete curbs to enclose a 20-foot-wide roadway. The parapets are faced with slightly recessed panels, providing the only architectural features for the otherwise plain structure.



Southwest Elevation not to scale

Figure 2. Elevation of Honey Creek Bridge. Taken from Marshall County Structure Inventory and Appraisal: Structure No. 244240.

Three Iowa firms responded to the county's bid solicitation in April: the Advance Construction Company of Waterloo, and the Marsh Engineering Company and N.M. Stark and Company, both of Des Moines.<sup>14</sup> The *Times-Republican* reported the supervisors' action:

The contract for six reinforced concrete bridges, ranging length of their spans from thirty to close to 100 feet were let by the board of supervisors Saturday afternoon to the N.M. Stark Company, of Des Moines, for \$14,090. The bridges to be replaced by the new permanent structures are widely scattered over the county, there being only two in any one township.<sup>15</sup>

By contract, the bridges were to be completed before October 1, 1910. Soon after the letting, Stark's crew began excavating for the foundations of the first bridge in State Center Township. Construction continued without report of incident through the summer. Costing \$4250.00, the Honey Creek Bridge was one of the structures completed by the contractor later that year. Since its completion in 1910, the Honey Creek Bridge has carried vehicular traffic in unaltered condition.

Marshall County continued with its program of concrete bridge construction in 1911 and 1912, contracting with Stark for several more structures.<sup>16</sup> In 1912 gazetteers William Battin and F.A. Moscrip counted nine spans over the Iowa River and about 160 creek bridges in the county. "Some of these are now being replaced as needed by concrete structures," they stated, "and many of the culverts are being made of concrete. Our people are learning the uses of concrete and how to make it."<sup>17</sup>

The county's almost exclusive dealings with Stark were to end in 1913,<sup>18</sup> however, when the state legislature passed the Brockway-Balkema Act that April. The new legislation codified bridge contracting procedures and standardized bridge design under the aegis of the re-organized Iowa State Highway Commission (ISHC).<sup>19</sup> One of the primary intents of the Brockway Act was to eliminate collusion and bid-rigging by bridge contractors.<sup>20</sup> Naturally enough, the state's bridge industry - led by N.M. Stark - strongly opposed its passage and even managed to defeat it at its first legislative session in 1911. After the act was passed in 1913, the highway commission responded in kind by attacking Stark and the Luten patent at every opportunity.<sup>21</sup> When the Squaw Creek Bridge in Ames collapsed after heavy flooding in June 1918, for instance, the commission criticized Stark's construction practices in its newsletter:

The [Squaw Creek] bridge had been built in 1908 and was of the Luten patent type of construction with concrete floor in the stream bed. This floor had broken up and disintegrated and the reinforcing of the pavement had also rusted badly. The bridge was built by the N.M. Stark Co. of Des Moines, over the protest of the engineers from the Engineering Department of the Iowa State College and of the State Highway Commission which, at the time, had no authority to enforce standards or supervision of construction but were in the position of giving advice only when advice was asked. The claim of the engineers was that the bridge was not of good design, that reinforcing metal was insufficient, improperly placed and over-stressed and that the concrete was also stressed beyond the point of safety according to the best standards in bridge design. The bridge was built at a cost of \$6,500.00, a saving of some \$1,500 over bids on a concrete arch design submitted by the Commission engineers.<sup>22</sup>

Eventually, Luten's patent rights were overturned in federal court and Stark himself was indicted for bid rigging.<sup>23</sup> The constant criticism by the highway commission, invalidation

of the Luten patent, regulated bidding procedures and increased competition from a newly emerging group of in-state bridge contractors all combined to take their toll on N.M. Stark. He never built another bridge in Marshall County after 1913; eventually he quit submitting bids at the lettings. Although Stark continued to build bridges into the 1920s, business dwindled until he was eventually forced to cease operations.

**B**uilt by one of Iowa's most prominent and controversial bridge contractors during the heyday of his career, the Honey Creek Bridge represents a period in Iowa transportation development in which the counties depended upon bridge companies for both design and construction, and the bridge companies in turn preyed upon the counties' vulnerability. This structure was at once one of the earliest concrete girders built in Iowa and among the last of the bridges built before the statewide adoption of standardized designs. It thus represents the transition between the formative years in Iowa bridge construction, in which the counties were left to their own devices for roadway bridge construction, and the later years, in which bridge design on all levels was standardized and directed by the state highway commission.

Concrete bridges - and particularly concrete girder spans - were just beginning to find favor among Iowa county engineers in the early 1910s, when the Iowa General Assembly mandated the standardization of bridge design. As a result, few such locally designed girders were built in the state. One of the first standards developed by the highway commission in 1913 was its so-called *H* Series, which consisted of concrete deck girder bridges with 24- to 40-foot spans.<sup>24</sup> From the initial 1913 design, the *H* Series Standard was modified periodically, as the concrete girder found widespread acceptance. The commission subsequently issued updated plans for the design in 1915, 1916 and 1928.<sup>25</sup> By the early 1930s, however, concrete girders were seldom used, as engineers in the state turned to less-expensive steel stringer structures for short- to medium-span bridges. From the hundreds originally built throughout the state, approximately 150 concrete deck girder bridges remain in use on Iowa's roads. All but eleven of these are comprised of one or two spans. The Honey Creek Bridge is thus distinguished as among the oldest and longest of the concrete deck girders in the state and among the few built from pre-ISHC plans. It is one of the first and last of its kind in Iowa.



## Endnotes

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<sup>1</sup>*First Annual Report of the Iowa State Highway Commission* (Des Moines: State Printer, 1906), page 5.

<sup>2</sup>Quoted in William H. Thompson, *Transportation in Iowa: A Historical Summary* (Ames, Iowa: Iowa Department of Transportation, 1989), page 93.

<sup>3</sup>*Second Annual Report of the Iowa State Highway Commission* (Des Moines: State Printer, 1907), page 25.

<sup>4</sup>By most accounts, the first automobile in Marshalltown belonged to Dr. C.C. Cottle. Cottle was followed soon after by John Vail, who drove a "two seated buggy-like contraption which was cranked on the side to start the motor." Gerard Schultz, *History of Marshall County, Iowa* (Marshalltown: Marshall Printing Company, 1955), page 87.

<sup>5</sup>*Third Annual Report of the Iowa State Highway Commission* (Des Moines: Emory H. English, State Printer, 1909), page 8.

<sup>6</sup>The three bridges were: one 35x16-foot span and one 30x16-foot span in Green Mountain Township and one 35x16-foot span in Melbourne Township. Contract between Marshall County and N.M. Stark, 1 June 1908, located at Marshall County Auditor's Office, Marshalltown, Iowa.

<sup>7</sup>The 1909 bridges included one concrete arch with a span of 35 feet, two 40-foot spans, one 45-foot span, two 50-foot spans and one 60-foot span, distributed throughout the county. Contracts between Marshall County and N.M. Stark, 3 February 1909 and 10 June 1909, located at Marshall County Auditor's Office, Marshalltown, Iowa.

<sup>8</sup>"A Good Bridge Man: A Sketch of J.B. Marsh, General Contracting Agent of the King Bridge Co., of Cleveland, Ohio, and His Principal Assistants," (Des Moines) *Saturday Review*, 11 February 1893; *Des Moines: the Pioneer of Municipal Progress and Reform of the Middle West* (Chicago: S.J. Clarke Publishing Company, 1911), pages 1020-1021.

<sup>9</sup>Ibid.

<sup>10</sup>"To Build More Bridges," *Marshalltown Times-Republican*, 20 February 1910.

<sup>11</sup>The seven bridges were located as follows:

- Bridge 217: 4½ miles west and south of Liscomb in Bangor Township
- Bridge 1605: 2½ miles north of Haverhill in Timber Township
- Bridge 1311: 2½ miles south of State Center in State Center Township

Bridge 323: 2 miles north of Clemens in Liberty Township  
Bridge 321: 3½ miles north of Clemens in Liberty Township  
Bridge 704: 4½ miles northeast of Albion in Taylor Township  
Bridge 1516: 6½ miles southeast of Melbourne in Logan Township

"Standard Specifications for Reinforced Concrete Bridges and Culverts," Marshall County Engineer, April 1910, located at Marshall County Auditor's Office, Marshalltown, Iowa. The last structure was dropped from the list after the contractors' bids were received, according to the *Times-Republican*, "because the board felt that this bridge would run the price higher than the board could afford to spend this year for new bridges." "Supervisors Let Bridge Contract," *Marshalltown Times-Republican*, 18 April 1910.

<sup>12</sup>*Atlas of Marshall County, Iowa* (Davenport, Iowa: Iowa Publishing Company, 1907); Marshall County Road Record, Book 1, page 92 (3 March 1856), page 139 (31 July 1858), located at Marshall County Auditors' Office, Marshalltown, Iowa.

<sup>13</sup>The description of the bridge is derived from the Marshall County Structure Inventory and Appraisal: Structure Number 244240, located at the Marshall County Engineer's Office, Marshalltown, Iowa, and from a field inspection of the bridge by Clayton Fraser of Fraserdesign, 4 February 1992.

<sup>14</sup>Proceedings of the Marshall County Board of Supervisors, Book 8, pages 138-139 (16 April 1910), located at the Marshall County Auditor's Office, Marshalltown, Iowa.

<sup>15</sup>"Supervisors Let Bridge Contract," *Marshalltown Times-Republican*, 18 April 1910.

<sup>16</sup>The county hired Stark to construct three concrete bridges in January 1911. In April 1912, Stark was underbid by the Capital Construction Company of Des Moines, and for the first time in five years Marshall County contracted with a different bridge contractor for a major construction project. Proceedings of the Marshall County Board of Supervisors, Book 8, page 151 (4 January 1911), page 179 (5 March 1912), and page 183 (1 April 1912).

<sup>17</sup>William Battin and F.A. Moscrip, *Past and Present of Marshall County, Iowa* (Indianapolis: B.F. Bowen and Company, 1912), page 455.

<sup>18</sup>In April 1913, the county contracted for the last time with Stark when it ordered five small concrete bridges to be built. Proceedings of the Marshall County Board of Supervisors, Book 8, page 202 (7 April 1913).

<sup>19</sup>For a more detailed discussion of the Brockway Act, see A.L. Ames, "History of the Iowa Road Law," *Iowa State Highway Commission Service Bulletin*, II:5 (May 1914), pages 2-12.

<sup>20</sup>In addition to the provisions of the law that established bridge bidding procedures, the Iowa legislature authorized the governor to direct the state attorney general to investigate and prosecute cases involving patent royalties or price fixing. *Iowa Journal of History and Politics: The Thirty-Fifth General Assembly*, Volume 11 (1913), pages 566-567.

<sup>21</sup>A particularly egregious example of this was a 1918 article written by Thomas H. MacDonald, Chief Engineer for the Iowa State Highway Commission (and later Director of the U.S. Bureau of Public Roads), which traced the history of Luten arches in Iowa and the commission's opposition to them:

In 1907, designs based on the Luten patents for reinforced concrete arch structures were for the first time brought generally to the attention of the counties in the state, through agents [essentially N.M. Stark] appointed by Mr. Luten. In 1907 the first Luten arch was built. From 1907 to 1913, a number of structures, varying from small culverts to large bridges, were built in about twenty counties. The impression has gone forth that these designs were used because of their popularity with the public generally. Such is far from the case. These designs were used because Iowa, until 1913, had no bridge laws, no county engineers, and few public bridge lettings were held. Each bridge company controlled, or at least attempted to control, the work in certain districts. The agents handling the Luten plans used these plans for the most part in the counties in which they controlled the bridge work and supplied their own plans. Probably ninety per cent of the bridges built on the Luten patented designs in Iowa were privately let without other plans or other competition being considered. In fact, in some cases there was not even a written contract covering the transaction.

Thomas H. MacDonald, "Bridge Patent Litigation in Iowa," *The Iowa Engineer*, XVII:4 (January 1918), pages 118-120. The criticisms by ISHC may have been valid to a point, but numerous Stark-built concrete bridges throughout Iowa have stood the test of time. In Marshall County, five concrete bridges built by Stark in 1910 and 1911 remain in use.

<sup>22</sup>"June Flood Damage to Roads and Bridges in Central Iowa Probably Will Total Quarter of a Million Dollars," *Iowa State Highway Commission Service Bulletin*, VI:5 (July 1918), page 4.

<sup>23</sup>"Millions in Tax Money Saved to Iowa by Federal Court Denial of Luten Bridge Royalties," *Iowa State Highway Commission Service Bulletin*, VI:1 (January 1918), pages 9-11.

<sup>24</sup>*First Annual Report of the Iowa State Highway Commission: 9 April 1913 to 1 December 1914* (Des Moines: State Printer, 1915), pages 27-28.

<sup>25</sup>See ISHC Standard Designs, *H-1* for Concrete Deck Girder Bridges, dated November 1915, 1916 and March 1928, located at Iowa Department of Transportation, Ames, Iowa.

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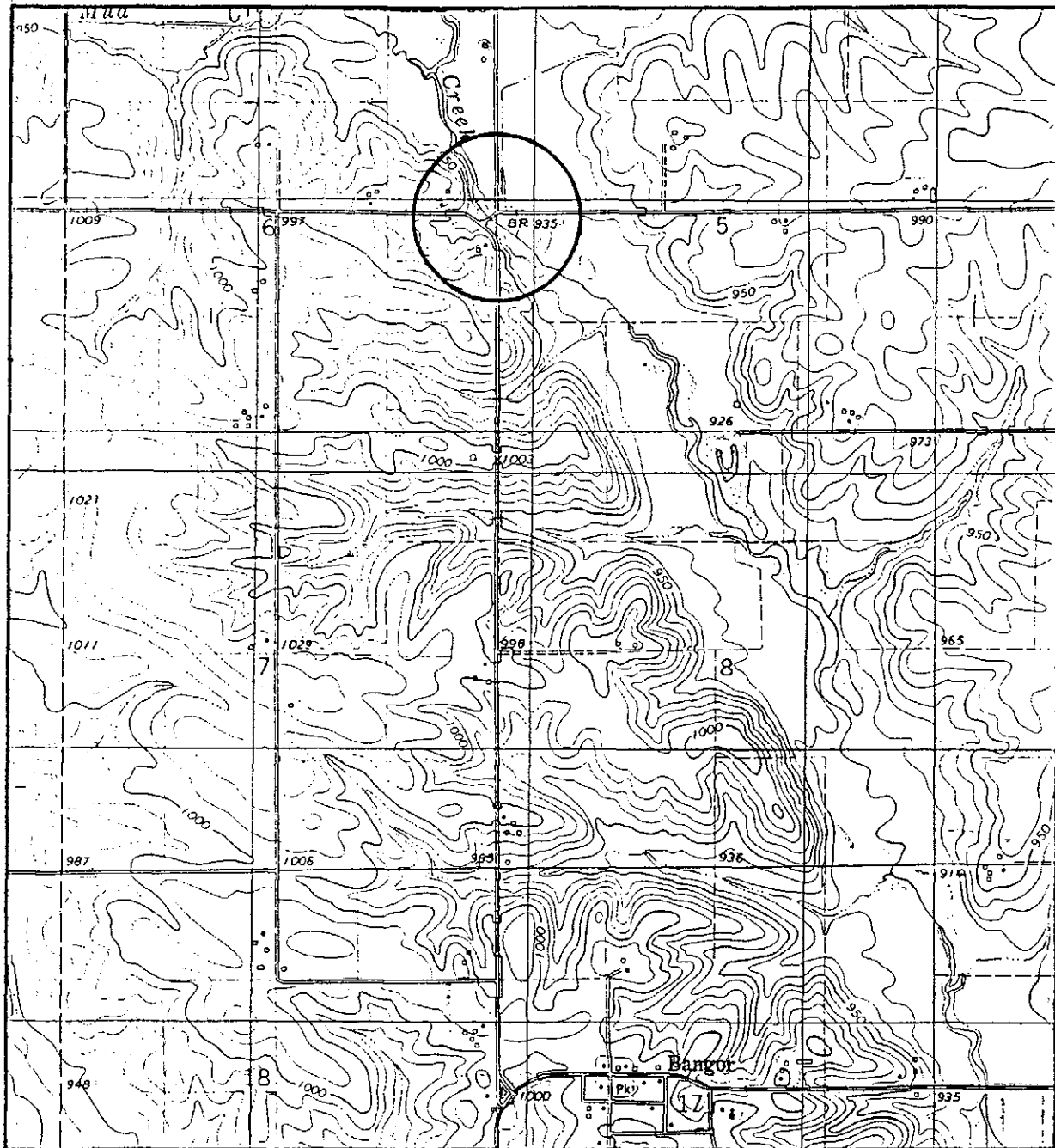
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Taken from USGS Union, Iowa, quadrangle map (7½ minute series, 1975).